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SCIENCE NEWS-LETTER

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FROG OR FISH?

Evolution Sometimes Becomes Reminiscent

(*See page* 92)

Vol. XIV *No. 384*

Evolution Reminisces

Zoology

"History repeats itself" is an old adage, which like many saws of its kind is not strictly true. However, it is true that in history situations sometimes rise which are very much like those of an earlier era, or one nation will go through an experience more or less similar to that which another nation has known.

And what is true in history is true also in natural history. Evolution never repeats itself exactly; yet one often comes upon queer creatures that are obviously doing over again on their own account things that our remote ancestors presumably did back in the days when the earth was young. Thus the Philippine goby, a queer little fish that lives among the mangrove roots on the tidal mud flats, has learned the trick that some fish or fish-like ancestor of all the land-living vertebrates practised away back in Devonian or Mississippian times. It flounders around on the drained ooze when the tide goes out, not worrying at all that the traditional "native element" of all fishes has gone away for a time, and it even creeps up sloping roots or sticks, clinging with its strong pectoral fins, which have become almost like legs.

There is even something in its appearance that is strongly reminiscent of the amphibians. Its wide mouth and its round pop-eyes, mounted on the top of its head as shallow-water fishes' eyes often are, give its head a decidedly frog-like look, which is reenforced by the rather bulging belly of the creature. If one could imagine a scaly tadpole metamorphosing into a frog, and producing front legs before sprouting hind ones, that would be a fair picture of a goby.

Science News-Letter, August 18, 1928

Avert Plague

Public Health

Word has just been received at the U. S. Public Health Service that an epidemic of plague was narrowly averted in Liverpool. Plague-infested rats were discovered on the steamer Sicily from Buenos Aires and Rosario, Brazil, when she was examined at quarantine. Word was immediately flashed from health authorities at Liverpool to quarantine officers in other ports where steamers from South America call.

This incident and the report of a fatal human case of plague in Monterey, Cal., on July 30 are reminders that plague is not at all remote and that it is only the vigilance of quarantine officers, routine and monotonous though their work may seem, that protects from the epidemics of plague that swept over the world in preceding centuries.

Plague first came into the United States through the port of San Francisco in about 1900. Local indifference and resistance to public health regulations made it impossible to stamp out the disease. The plague-infested rats were killed during the earthquake, but not before they had transmitted the organisms of the disease to the ground squirrel. These animals now constitute a huge reservoir of plague, resulting in frequent human cases. The vast territory, wild, inaccessible and uninhabited, in which these squirrels roam makes it practically impossible to stamp out the disease now.

Science News-Letter, August 18, 1928

Orang-utans are in danger of extermination in Sumatra, since natives art catching large numbers for zoo collectors, and since many of those transported die en route.

A road building expert estimates that Pennsylvania automobile owners save $51,750,000 a year in operating costs, as a result of hard surfaced roads.

In This Issue—

Evolution Reminisces, p. 92—Avert Plague, p. 92—Singing *Insects,* p. 93—Icebergs *Born,* p. 95—*Unmix* Oil and Water, p. 97—Artificial *Diamonds,* p. 99—3,375 *Pounds,* p. 101—Baths Cure, p. 101—*Test* Fails, p. 101—Flying *Fish,* p. 101—New Mexicans, p. 103—Study Coral *Reef,* p. 103—*Ancestral* Hooch, p. 103—Electrocuted *Tree,* p. 103.

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All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

Singing Insects Hear With Front Legs

Entomology

When the great katydid chorus breaks loose in the treetops these moonlight nights of August, presaging thereby, according to the folklore of the country, a frost in six weeks, few in the audience realize that the synchronism of the insect orchestra is maintained by a complicated little mechanism on the green fiddlers' fore limbs.

For science has established that katydids hear with their front legs.

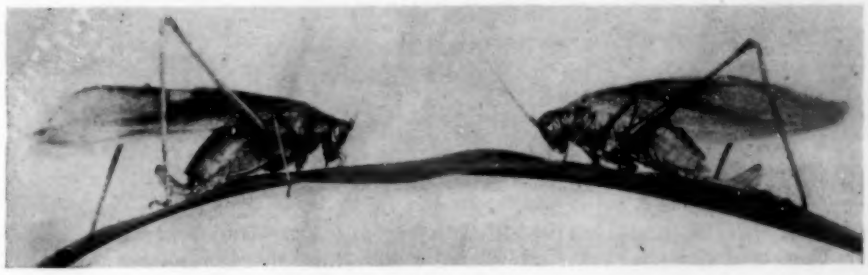
The whole question of how insects hear, see, smell and otherwise exercise their sensory functions has been the occasion of much learned entomological wrangling. Some have even declared that they did not hear at all. But an enterprising young entomologist at Iowa State College, who has recently moved to the State College of Agriculture of North Carolina, Dr. B. B. Fulton by name, decided to settle the question by actual experiment.

There are on the front pair of legs of certain insects of the grasshopper type, organs similar in structure to those used for hearing in higher animals. Only the species having stridulatory or singing organs have also the tympani on the foremost pair of legs. Whether they actually served this purpose or not, however, has been disputed vigorously. One student advocate of the auditory as well as ambulatory function of grasshopperine legs summed up the problem succintly by the remark, "If they aren't ears, then what are they?"

Close comparison of concerts participated in both by de-legged performers and those with the full complement of extremities was the method chosen by Dr. Fulton for "getting the dope" on the green-winged violinists.

It has been shown recently that various moths and butterflies appear to perceive sounds, he pointed out. Caterpillars of at least two species have been found to react to sounds, though one failed to do so when the body hairs were loaded with water, showing that these hairs are concerned in sound perception.

"The fact that certain species of singing Orthoptera (the name given by scientists to insects of the grasshopper type) synchronize their notes seemed to me conclusive evidence that they could hear each other," Dr. Fulton explained. "Such a simultaneous sounding of notes could hardly be a matter of accident. Neither is it an auditory illusion as some writers have claimed. While studying the songs of the tree cricket and a couple of other singing insects, I was impressed with the idea that here was excellent material for testing the auditory powers of the tympani on the foremost legs. Accordingly, I set about collecting males of all such species as were available in this locality."



"KATY DID!" "SHE DIDN'T!" These tireless advocates argue with their wings and listen with ears located in their legs

The first demonstration was staged with ten male katydids of a sort commonly found on the prairies. They were placed in a cage where night after night they exhibited almost perfect synchronization.

"This insect," said Dr. Fulton, "starts singing in the afternoon and as evening approaches the number of singers increases. The song is under ordinary conditions a series of 20 to 30 short metallic rasps at the rate of four per second. Each series of notes lasts about five to seven seconds and is followed by a period of rest of about five seconds.

"The synchronization of my ten caged singers was practically perfect. The song of the group was continuous and as each individual started its series of notes anew it would fall in with the general cadence. It was only by detecting slight variations in the quality and volume of the chorus that one could be aware of the pauses in the individual songs.

"After observing the song of the whole group for two nights I removed four males to another cage at some distance from the first and cut off their front pair of legs close to what corresponds to the thigh. For the two following nights only one of the mutilated katydids was heard singing at one time. On the third night two sang more or less continuously. The notes were not synchronized except as they happened to sound together at times. The two males happened to have slightly different normal rates, so that if they started their series of notes in unison they would usually be sounding them alternately at the close. I observed 36 consecutive periods when both males were singing at once and of these there were only two when the notes did not interfere at some time during the period. Following these observations I went back to the cage of normal insects and listened carefully to four singers for ten minutes. During this time there were only two short intervals during which a few notes were sounded out of cadence as one of the singers began a series of notes.

"In order to be doubly sure that my senses did not deceive me I requested some one who had no knowledge of the experiment to listen for a few minutes at each cage to se if they could detect any difference in the songs. This observer noted at once that the song was rhythmical and synchronized in the first cage but not in the second."

The insects did not seem to be greatly disturbed by the loss of their front members, for those so operated upon lived as long as those that possessed all their legs intact, a condition which argues in favor of the often-repeated statement that insects are not very sensitive to pain. Grasshoppers, it is well known, rather frequently kick off one or more legs voluntarily to escape capture.

The next batch of victims were snowy tree crickets, the collective authors of that shrill melody of sound that seems to come from nothing out of everywhere out-of-doors on summer evenings when the shadows begin to darken. This music is probably the most familiar of all insect sounds, but the musicians themselves are little known to the public. They were divided in two lots like their predecessors and put into separate cages.

"After waiting a few days," Dr. Fulton went on, "to see that both cages contained willing singers, I amputated the fore- (*Turn to next page*)

Singing Insects Hear with Front Legs—*Continued*

THE KATYDID'S EAR, located on his front leg, just below the knee joint

limbs of one lot and removed their cage from the vicinity of the other lot. The results were essentially the same as with the preceding experiment. When only two of the mutilated males were singing at once the effect was that of being synchronous at regular intervals separated by periods during which the notes sounded alternately. This effect is produced by any two sets of rhythmically repeated sounds having a slightly different frequency. Each cricket sang at its own individual rate uninfluenced by the song of others in the same cage. When three or more mutilated males were singing at once an utter confusion of notes resulted, so that the rhythmical quality of their song was entirely obscured.

"The song of the normal tree crickets in the other cage presented a striking contrast. Each individual sounded its notes in unison with others, as if a single cricket were singing."

The third insect used in the series, a grasshopper of the plains known as the Nebraska conehead, proved to be the most remarkable synchronist of all.

"Their song," said the entomologist, "consists of rasping buzzing notes, each lasting a little over a second and separated by about equal intervals of silence. The length of the notes and their low frequency makes this species an easy one to study.

"At a temperature of 76 degrees Fahrenheit there were only 23 to 24 notes per minute. I have observed them in the field synchronizing their notes at a distance of 20 paces.

"I used only four males for my experiments this time. It is rather difficult to select Nebraska coneheads, for they sing only at night and each specimen has to be captured by careful stalking while it is singing. I placed my quarry of four in individual cages and separated them into two groups, which were kept out of hearing from each other. After testing all of them for synchronism, which proved to be perfect, the front legs were removed from two of them.

"On the second evening after the 'operation' both coneheads were singing with conspicuous lack of coordination. For about a minute at a time the notes of the two would sound alternately, then gradually one song would catch up to the other, so that for another similar period the notes would sound simultaneously.

"At the same time the normal coneheads were keeping up perfect synchronism. Sometimes one note could be observed to start a fraction of a second ahead of the other, but never once did I hear them entirely separated."

Such a simultaneous sounding of notes as the uninjured insects produced can hardly be a matter of accident, Dr. Fulton declared, and appears to be conclusive evidence that they can hear each other.

The structure in the tympanum on the leg, believed to be actually responsible for hearing, resemble exceedingly minute pegs. Each one is hollow and filled with a watery liquid and has an axis-fiber or nerve-fiber running through it. The end of the fiber nearest the body connects with the insect's central nervous system.

The structures in the tympanum led early investigators to believe that they were hearing organs, though actual demonstration has been lacking until now. Structures containing auditory pegs have been found in a number of other insects, for instance, in the basal segment of the antenna or "feeler" of the male mosquito. It was even shown as far back as 1874 that the bristles that cover the outer segments of the antenna could be made to vibrate by certain musical notes, the shorter bristles near the tip vibrating at a higher pitch than the longer basal bristles. However, there was no way to tell whether the male mosquito perceived any sensation of sound, so even this evidence was circumstantial.

Another interesting fact about the music of the Orthoptera is that the pitch and also the frequency of notes vary directly with the temperature just as the speed of a chemical reaction does. Since the insects do not regulate their body temperature like the warm-blooded animals, their rate of metabolism is subject to the whims of the weather. With insects like the snowy tree cricket which sing a continuous rhymthical series of notes, this correlation is very evident.

When neighboring crickets are synchronizing, Dr. Fulton pointed out, they adjust their individual rates to meet the needs of the chorus, though this adjustment is possible only to the extent of a few notes per minute.

"I have found," he added, "that in the case of this cricket there is such a thing as a geographical variation in song. In general, the frequency of notes at the same temperature increases as one goes from east to west. I have had living crickets from Ohio, Arizona and Oregon caged side by side and it was interesting to hear them try to synchronize. Their natural rates of song were so different that they found it impossible to make sufficient adjustment. While the snowy tree cricket of Oregon sings at the most rapid rate of any I have observed, there is a distinct variety there which sings only about half as fast."

The katydids, however, constitute the real aristocracy among the singers of the six-legged world. In Europe the true katydid is unknown, his family being simply styled the long-horned grasshopper to distinguish them from their short-horned, heavy-bodied brethren.

Their musical instruments are located on the overlapping bases of the front wings. They are the special gift of the males, the females having to content themselves with the primitive wing structure common to the rest of the Orthoptera group. The fore part of the right wing of the favored sex consists of a thin crisp membrane with a stiff ridge on the basal angle. On the left wing one of the veins is thickened into a close series of ridges on the under side which convert it into a veritable file. The wings of katydids are always folded with the left overlapping the right in such a position that the file of the former lies above the ridge of the latter. When the wings are moved sideways, the file grates on the ridge or scraper, causing a rasping sound, and this is the way the katydid produces its famous song. The tone and the volume are probably due largely however, to the thin membranes in the base of the wings.

The instruments of the different families of songsters vary somewhat in the details, but in general the notes produced by the (*Turn to next page*)

Singing Insects Hear with Front Legs—*Continued*

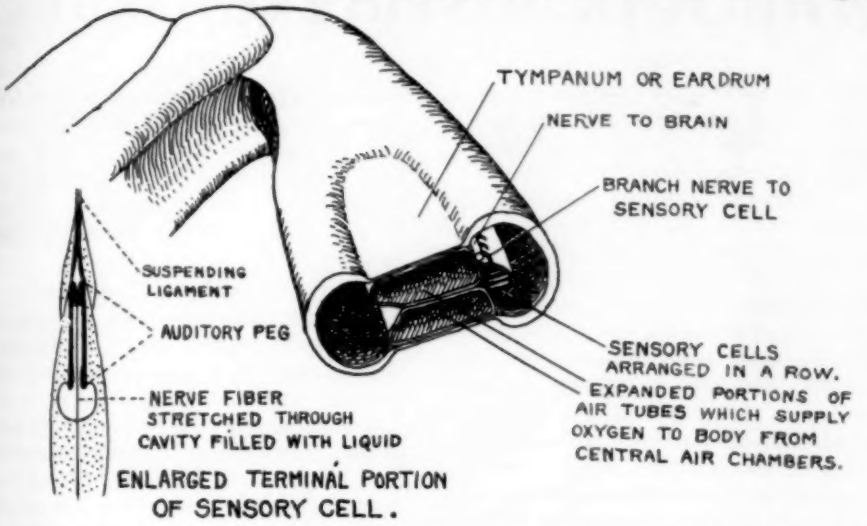

TYMPANUM OR EARDRUM
NERVE TO BRAIN
BRANCH NERVE TO SENSORY CELL
SUSPENDING LIGAMENT
AUDITORY PEG
SENSORY CELLS ARRANGED IN A ROW.
EXPANDED PORTIONS OF AIR TUBES WHICH SUPPLY OXYGEN TO BODY FROM CENTRAL AIR CHAMBERS.
NERVE FIBER STRETCHED THROUGH CAVITY FILLED WITH LIQUID
ENLARGED TERMINAL PORTION OF SENSORY CELL.

DIAGRAM OF THE HEARING APPARATUS in the foremost pair of legs in the singing insects

different owners have a range out of all proportion to the variations in the musical apparatus. The stridulating instruments are not developed until maturity when the performer starts in to play his inherited tune without any preliminaries. As one entomologist has remarked: "He never disturbs the neighbors with doleful notes by practicing."

The member of the numerous katydid clan known far and wide to the American public as the greatest of insect singers, is called by scientists by the mellifluous name of *Pteropyhlla camellifolia*. Whether he is a great musician or not depends on the personal taste of the critic, but of his fame there is no question. Certainly, nothing could be plainer than his vociferous "Katydid" with its endless repetitions and variations, "Katy," "Katy didn't," "Katy she did."

Though the audience of the katydid has a wide range, few claim the privilege of personal acquaintance, from the fact that he has selected for his stage the tallest treeetops and seldom descends from his chosen orchestra circle. Country-raised boys and girls and hard-hunting field entomologists know him, but not many more. In color he is plain green with a dark brown triangle on the back covering the stridulating area of the wings. His body is fully one and three-quarters inches long, while his long hair-like antennæ measure well over two and a half inches. The rear edges of the leaf-green wings are evenly rounded with their sides plumped out as if to cover a corpulent rotund body. This is a false alarm, however, for the space between them is mostly empty and probably forms a resonance chamber to give tone and volume to his musical performances. He has a row of prominent waistcoat buttons down his front, or rather his underneath, that rhythmically heave and sink with each breath.

Another insect singer much in the public eye is the black field cricket, a friendly soul of garden and dooryard, not averse to taking refuge in the house itself on cool autumn evenings. His European cousin is the famous cricket on the hearth of Dickens' story. The ancient Greeks and Romans called him Gryllus, a name which he bears to this day. His musical organs are much like the katydid's but, unlike the latter, he has them equally developed on each wing. So that he can apparently play with either wing uppermost, though in actual practice most crickets consistently wear the right wing uppermost, just the reverse of the katydid custom.

The snowy tree cricket that played a prominent role in Dr. Fulton's concert is really green, but of such a pale shade that he looks white at night. In the great out-of-doors orchestra on warm summer nights, a careful listener may distinguish a short blast repeated a hundred or more times a minute. This strenuous performance is produced by this pale little ghost of an insect no more than half an inch long. The singer raises his wings vertically above the back and vibrates them sideways so rapidly that they are momentarily blurred with each note. He repeats regularly and monotonously all night long. When he first begins singing in July there are about 125 beats per minute, but later on hot nights the rate will go as high as 200. As fall comes on it decreases to around 100 and finally as the nights grow cold, the notes end in hoarse bleats repeated slowly and tremulously, though still rhythmically, as if the singer were numb with cold or pain. With the coming of the first frosts they die away altogether.

Science News-Letter, August 18, 1928

Birthplace of Icebergs

Geography

The birthplace of the icebergs that menace the transatlantic steamers has been located by the oceanographic expedition of the U. S. Coast Guard on board the steamship Marion.

The ship is now well above the Arctic Circle and has just proceeded across Diske Bay between hundreds of towering ice islands.

"We are now viewing the birthplace of the icebergs of the North Atlantic, the entrance of Jacobshavn Fjord, which is literally jammed with thousands of bergs so close that we cannot penetrate with the vessel," Commander Edward H. Smith, in command, explained in his report to Science Service.

The Marion on its voyage northward in Davis Strait between Labrador and Baffin Land on the west and Greenland on the east, has noted the number of icebergs. The scientists aboard have also charted the ocean currents that bring the icebergs southward to endanger the steamship tracks. The contour of the sea floor that sometimes allows the great ice masses to ground and be delayed in their southward journey is also being investigated.

Commander Smith will shortly head a landing party that will investigate the Greenland ice cap at this point. The rate of movement of the glaciers that drop the icebergs into the sea will be measured. New knowledge of the rate at which icebergs are born of the ice cap is expected as a result of these studies.

Amateur radio station 2WI, operated by William A. McClintock at Westfield, N. J., cooperated with the Marion expedition and Science Service in establishing radio contact with the Marion's radio station, NITB.

Science News-Letter, August 18, 1928

A bronze lock found on a tomb near Jerusalem and dating back to the early Christian era is pronounced a safety device of an elaborate type not known in modern Europe before the end of the eighteenth century.

Modern World Depends on Newton

Physics

ROBERT A. MILLIKAN, before a committee of the National Academy of Sciences:

Subtract the idea that was born with the formulation of Newton's law of motion from modern civilization and that civilization collapses like a house of cards and mankind reverts at once to the mode of life existing in ancient times. Without this idea of the ancient Galileo, as expressed in Newton's famous equation of motion, not a single dynamical machine in existence today could have been designed.

It is true, too, that this equation changed man's whole conception of the universe, though it took at least two centuries to accomplish that result. This was the indispensable idea that made possible the development and the ultimate triumph of celestial mechanics. Other ideas contributed to that end, but this was the cornerstone. It was two centuries before it found any particular applications at all, but during all that period it reshaped philosophy and reshaped religion, for through it mankind began to know a God not of caprice and whim, but a God who works through law. It changed conceptions of duty, too, because it began to reveal a nature of orderliness and a nature capable of being known, a nature, too, of possibly unlimited forces, capable of being discovered, and then of being harnessed for the benefit of mankind. But it is not even in these services that the idea finds its chief credentials.

It was the *method* of Galileo, followed by Newton and Faraday and Maxwell and Pasteur and Darwin, and a host of others who caught its significance, which has brought into the ken of mankind the conception of an evolving, developing, progressing world. Through it we have learned to read the story of the *geological* evolution of the earth, of the evolution of *life* on the earth, or human history and civilization, of the stars themselvies, and even of the elements of which the stars are made.

Is it not the most sublime, the most stimulating conception that has ever entered human thought, this conception of *progress*, absolutely unknown in ancient times, a progress of which we are a part, and in which we can ourselves play a role of outstanding importance? For through the method of Galileo and the success that its pursuit has already brought, mankind has begun to glimpse the limitless possibilities ahead of it in the understanding of nature, and in the turning of her hidden forces and potentialities to the enrichment of life. Nobody knows to what limits we shall be able to go with the aid of this method, but if the past three hundred years is an index of what the next three hundred years may be, then the supreme question for all mankind is how it can best stimulate and accelerate the progress of research in pure science, for this was precisely what Galileo's method was.

Forego the industrial applications! They will come any way as fast as the foundations are laid. They may, indeed, not come at once, as they did not in the case of the equation $f = ma$, but they cannot help coming in just about the proportion in which the advance in our knowledge of nature is made, for every increment to our knowledge of the way in which nature works inevitably increases our ability to control nature and to turn her hidden forces to our own account.

If the view which I am urging seems extreme, I am at least not alone in holding it. Pasteur, whom the French nation has repeatedly voted the greatest of all Frenchmen, expressed the following judgment:

"In our century science is the soul of the prosperity of nations and the living source of all progress. Undoubtedly the tiring discussions of politics seem to be our guide—empty appearances. What really leads us forward is a few scientific discoveries and their applications." . . .

Science News-Letter, August 18, 1928

Flowers Change from Buttercups to Lilies

Evolution

FREDERIC E. CLEMENTS and EDITH S. CLEMENTS, in *Flower Families and Ancestors* (Wilson):

Though the conversion of buttercups to lilies must have taken a long time, the actual number of steps is not many. Indeed, the most striking feature of the lily flower is already found in those buttercups with a number plan of 3, a plan that more or less disguised is still found in the orchids and grasses. The flowers of arrrowheads and water-plantains show no other important difference from those of buttercups, but the plants have become lake-dwellers and have changed their stems and leaves accordingly. Some of their descendants became tired of the placid life in water, and ventured forth upon the land. Those that had lost the corolla requisitioned a leaf, painted it in bright colors and wrapped it around the naked flowers for protection and attraction, and thus became calla "lilies", jack-in-the-pulpits, and anthuriums. Others enlarged and brightened the corolla, and united the pistils to secure better pollination with the use of less material. These became day-flowers and spiderworts, with a green calyx, blue or purple corolla, six stamens and three pistils in one. No further change of importance was needed to transform these into the trilliums or wake-robins, the simplest members of the lily family. However, the true lilies owe their beauty to an evident need for greater attraction. This has been secured by coloring the green calyx like the corolla, so that the latter appears to have six petals. This advance proved so successful that all the insect pollinated descendants, snowdrop, daffodil, iris, and orchid, exhibit it, and its effects are to be traced through the wind-pollinated rushes and sedges to the grasses. Like the buttercups, the lilies, too, have made their own experiments, but they have been much more conservative as to their flowers. In spite of striking differences in color, shape and size, lilies of all sorts, tulips, mariposas, onions, hyacinths, aloes, asparagus, lily-of-the-valley, and yuccas, are easily recognized as members of the same family.

Science News-Letter, August 18, 1928

The world's largest bell is still the 180 ton bell of Moscow, cast in the eighteenth century.

Seek to Unmix Oil and Water

Chemistry

Following are additional reports from the Institute of Chemistry of the American Chemical Society meeting at Evanston, Ill.

The old adage that oil and water can't be mixed makes the oil producer smile wryly when he hears it. For like many another proverb it is very far from the truth, and in this instance it is a most expensive joke on the oil man, according to Dr. Gustav Egloff of Chicago.

Oil and water do not mix as a chemical compound, it is true, but they often come out of oil wells together in that very intimate physical mixture known as an emulsion, wherein very fine droplets of one are suspended in the other and won't come out without the most troublesome and expensive of treatment. Thus it has resulted that Nature every year burdens the oil industry with 200,000,000 barrels of intimately mixed oil and water as emulsified crude oil. Such oil does not separate its water even after years of storage. To refine emulsified crude oil into dry oil and water is both difficult and expensive.

"There are at present over 100,000,000 barrels of emulsified crude oil in storage tanks and in sump-holes in the ground, and the refiner is at his wits' end as to how to separate the oil from the water," Dr. Egloff stated. "Thus over $100,000,000 is tied up in stored emulsified oil for whose utilization no really economical method has been evolved, which is applicable to all situations.

"Not alone do we have Nature producing highly stable emulsified oils, but they are also produced in the refining process, particularly in the manufacturing of lubricating oils. As a matter of fact extremely thorough refining is necessary to produce lubricating oils which will not emulsify under service conditions in motors and turbines."

Inhibition, one of the bogey-words of Freudian psychology, has an entirely different and beneficent meaning as applied in industrial chemistry. Minute amounts of chemicals are in some way as yet imperfectly understood able to slow down the multifarious processes lumped under the head of "spoiling," and these are known as inhibitors. Dr. N. H. Alyea of Princeton University explained what is known of these inhibitors and their action.

The most familiar inhibitor is tetraethyl lead, which inhibits ordinary gasoline from causing engine knock. A thimbleful of this added to a gallon of gasoline turns the trick. Other inhibitors make tires live longer, keep dyes from fading and prevent the important new industrial chemical furfural from spoiling. An inhibitor has been found which will prevent butter from becoming rancid, but unfortunately it is a poison, so chemists will have to resume the search for one that will do the same work without making the butter dangerous to the consumer's peace of digestion.

"The quest for synthetic rubber may be compared to the quest for the Golden Fleece, the Fountain of Youth, or the Philosopher's Stone, in so far as the objective appears exceedingly unlikely of attainment, but the quest has been very fruitful in secondary results for the general improvement of rubber technology and scientific knowledge."

This was the theme of Thomas Midgley, Jr., of Dayton, Ohio, noted as the inventor of ethyl gas.

Rubber is, chemically speaking, a multiplication of an organic compound known as isoprene, and many attempts, some of them successful on a laboratory scale, have been made to make rubber out of this substance. But none of these isoprene rubbers has the stretch and bounce and other physical qualities needed for full-fledged commercially successful rubber. In the investigation of the differences between the artificial and the natural products, however, chemical discoveries have been made that now have wide application in rubber manufacture and in certain other industries as well.

Liver, once given away by country butchers, has climbed into a top place in the aristocracy of the meat market, and chemists are ardently wooing it to learn its secret. This is the result of the recently discovered value in the treatment of human ills, especially pernicious anemia, Dr. David Klein of Chicago told the Institute.

At present pernicious anemia sufferers in pursuit of health have to eat liver by the pound, the speaker said, but it is the hope of the chemist to find out the particular small fraction of its mass that makes it "good for what ails you." His ambition is to get it out in pure form, analyze it, give it a long, hard name and then make it in the chemical factory. And what he hopes to do for liver he also wants to do for the thyroid, suprarenal, pituitary, parathyroid, and all the other ductless glands, whose influence on our health and often on our very character is pronounced though as yet only partly understood.

Goldenrod pollen does not cause hay fever, and roses do not cause "rose fever." This is the verdict of Edgar B. Carter, Indianapolis specialist in pollens. These plants and all others with bright, attractive flowers, do not shed their pollen into the air to drift into sensitive noses, but intrust it to insects for carriage to other flowers.

It is the air-borne pollens, the speaker said, that cause the trouble.

"Many plants, especially trees, grasses and weeds, bear blossoms that are quite inconspicuous and quite unattractive. . . . From such plants the pollen is shed into the air in such profusion that it carries for miles as an invisible cloud. During the time when some of the plants are pollinating, particularly the grasses in June and early July, and the ragweed in August and September, the air is literally filled with this invisible pollen which affects so profoundly those human beings who happen to be sensitized to it. It has been estimated that at times during the fall hay fever season there have been more than 1,000 granules of ragweed pollen in each cubic yard of city air, even to the height of the tallest buildings."

When we look at a photograph, or at a movie film, we are really crystal-gazing, although we may not be aware of it. We do not see the crystals, because they are too small to be distinguished separately without a microscope. Dr. C. E. Kenneth Mees, of the Eastman Kodak Company, explained how the new knowledge of photographic crystallography is being used in obtaining better pictures.

"A single motion picture examined under the microscope is found to be composed of tiny particles of silver which look like little masses of coke," he said. "These are derived from the crystals of silver bromide in the creamy-white sensitive layer exposed in the camera, and there are more crystals on a square inch of the film than there are human beings on the surface of the globe.

"Recently, scientists have determined how the atoms build up the crystals and have (*Turn to next page*)

Chemical Society—*Cont'd*

measured their sizes and shapes in different kinds of film. By careful adjustment of his processes, for instance, the manufacturer includes a great range of sizes of crystals in his negative film, which enables the beautiful gradation to be obtained. A more uniform size of crystals in the positive film gives life and sparkle to the pictures."

The speaker explained how a chance impurity in the photographic chemicals has worked to the advantage of the picture-making professions. "The sensitiveness of the grains of silver bromide is increased by the presence of specks on them produced by an accidental impurity in the gelatin derived from plants eaten by animals from whose skins the gelatin is made. It contains sulphur, which reacts with the silver bromide and forms specks of silver sulphide on the crystals. Under light, this produces a trace of metallic silver and during development is a nucleus on which more silver deposits; finally, the whole crystal becomes silver. These grains of silver compose the picture projected on the screen."

Science News-Letter, August 18, 1928

Ills We Do Not Have

Immunology

J. B. S. HALDANE, in *Possible Worlds* (Harper):

As I ate my gorgonzola cheese I attempted to console myself for a violent cold in the head by meditating on some of the ills that human flesh is not heir to.

For that cheese was very ill. It had first been attacked by a gang of most ferocious bacteria and finally by a green mould. But to all its diseases I was immune. If I had eaten a slice of mutton equally full of bacilla they would certainly have proceeded to attack me, while a cheese of milder character would have caught the green malady from the gorgonzola.

Fortunately, however, man is immune not only to the microbes of cheese but to most of those which attack animals. We do not get distemper from our dogs and very rarely foot-and-mouth disease from our cattle; though we share with the latter a liability to tubercle, and there is a rare and generally fatal lung disease which old ladies occasionally get from parrots.

Science News-Letter, August 18, 1928

More than four-fifths of Greenland is buried beneath a great continental glacier.

Science is Good Reading —*if it's Good Science*

Says Dr. E. M. East, of the Bussey Institution, Boston, in speaking of the more general spread of reading of an informative character, in the Journal of Heredity:

"Out of some fifty books for the general public purporting to be psychology that I have recently examined, two-thirds appear to have been written by voodoo worshippers. From a still larger number of volumes on biology, chemistry, physics and their applications, I find less than half a dozen which give the impression that the authors are acquainted with their subjects . . . . there is a plenteous supply of informative, thoughtful books written by master hands, and there is a demand as evidenced by the sale of the sludge mentioned above. Why do the two so seldom meet?"

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CLASSICS OF SCIENCE: Moissan's Artificial Diamonds

Chemistry

In view of the recent controversy as to whether the crystals Moissan made in his electric furnace were really diamonds, it is interesting to read the original account of Moissan's experiments. If you have the equipment, perhaps you can make some of these minute hard crystals and try your hand at analyzing them. Science Service would appreciate samples of any crystals made by Moissan's method.

The Diamond

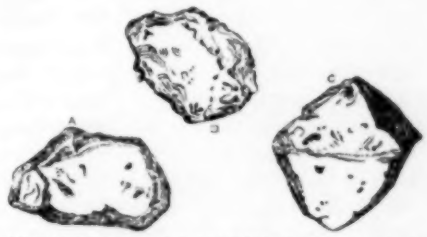
The diamond can be defined as follows: A simple body, having the greatest hardness, a specific gravity of 3.5, burning in oxygen above 700° and of which 1 gram by its combustion in oxygen gives 3.666 grams of carbon dioxide.

The three important factors are: The hardness, density, and combustion in oxygen. Heretofore the ordinary clear diamond scratched all other bodies and was scratched by none. We have demonstrated that this great hardness, which was believed to be a peculiar characteristic of the diamond, is also found in some of the new compounds that we have prepared in our electric furnace. The carbon boride slowly cuts the diamond and the titanium silico-carbide has a hardness which is almost equal to that of the diamond. On the contrary, certain varieties of *bort* of indistinct crystallization well known to jewelers, and the black diamond, possess greater hardness than the new compounds.

The electric furnace has increased the number of bodies which are hard enough to scratch the ruby. Among these may be mentioned silicon carbide, and many carbides, borides, nitrides, silicides, and silico-carbides of the metals. . . . It is necessary, then, in order to be considered diamond, that it must possess the three properties: Hardness, density, and the property of burning in oxygen, forming 3.666 grams carbon dioxide for one gram of substance burned. Each experiment, which rests on but one of these three properties, is insufficient and can lead to a false conclusion.

Combustion in Oxygen

In order to determine the combustion point, we used the electric pyrometer of Le Chatelier, which was placed in a porcelain tube that was glazed inside and outside. The alloy was placed on a small platinum support which contained the diamond to be burned. This apparatus, closed at each end by glass stoppers, cemented to the porcelain tube, permitted the combustion of the diamond in oxygen to be observed.*



ARTIFICIAL DIAMONDS prepared by Moissan. The originals of these magnified drawings were about 1/80th the size of the pictures

Two small drops of baryta water were placed in the apparatus, the one after the oxygen in order to insure its purity, the other after the porcelain tube, to determine when the combustion began. When the temperature was raised the combustion of the diamond, recognized by the action of the carbonic acid on the baryta water, proceeded slowly at first and without apparent production of light, but when the temperature was raised 40° to 50° the combustion was accompanied by light and the diamond was surrounded by a distinct flame.

Another curious fact was observed in these experiments. During the combustion of the diamond there was always observed to appear on its surface small, opaque particles, which indicate the transformation of the transparent into black carbon, while at the same time the combustion continues. . . .

How Are Diamonds Formed?

The geological studies made on the different rocks in which crystalline carbon is found establish indisputably that the diamond is not a vein mineral. . . .

It sometimes happens that the diamonds taken from the blue ground of the Cape are frequently cleaved or cracked open. Cannot this phenomenon be considered as indicating an unstable physical state due to a strong pressure which has acted at the time of formation of the diamond? None of the diamonds in all that I found show clearly a point attached to any rock whatever. It appears as though the diamond had formed in a liquid or pasty mass; consequently it is necessary to know the solvent which has been used.

According to the known properties of carbon and according to the experiments described in this work, it is mainly the metals which dissolve carbon, and best of all, iron. When it is remembered that the blue ground of the Cape contains, as I have shown, perfectly crystallized graphite, and that well-crystallized graphite is formed most readily in fused metals and not by volatilization, there is introduced the crystallization of carbon in fused iron under pressure.

I would add that the study of the ash of the diamond, in which iron is always found, leads to the same conclusion. . . .

Such are the ideas, true or false, which brought about the change in the direction of my investigations on the diamond and caused the intervention of pressure. I do not know if this theory will stand the tests of my successors, but it is to it that I owe the experiments which I will describe and that have brought about the preparation of the artificial diamond in microscopic crystals.

Detail of the Experiments

In order to make the experiments, I utilized the pressure produced by the increase of volume which a fused mass undergoes at the moment of passing from a liquid to a solid state. It is known that solid cast iron has a less density than liquid. It is a fact known in industry that pig iron floats on the surface of a bath of the fused metal.

Cast iron, like water, increases in volume at the moment of solidification. We begin these studies by heating in an oxyhydrogen blowpipe, a small quantity of iron in a carbon crucible, then immersing the whole in cold water.

Since the first experiment gave only doubtful results, we thought it was necessary to saturate the iron with carbon at a higher temperature. To obtain this result we used the electric furnace. At the high temperature furnished by this apparatus iron dissolves a large quantity of carbon, which is subsequently deposited as graphite when the iron again solidifies. This experiment was carried out in the following manner: 200 grams of soft Swedish iron cut into cylinders, 1 cm. to 2 cm. in length and about 1 cm. in diameter, were placed in a carbon crucible and completely covered with sugar carbon. Since, at the beginning of this work, we gave the arrangement of the electric furnace, it is not at present repeated. It was (*Turn to next page*)

Artificial Diamonds—*Continued*

heated from three to six minutes with a current of 35 amperes at 60 volts. The cover of the furnace was raised by the hand wrapped with a cloth, the edge of the crucible was grasped with a pair of iron tongs, and was plunged into a vessel filled with cold water. The crucible and contents remained at red heat for several minutes, with evolution of bubbles of gas which burst at the surface without taking fire. The temperature fell rapidly, the light faded and the experiment was ended (Fig. 24).

It was not without great care that we made this experiment the first time, for I wondered if there would not be an explosion when a crucible of molten iron, having a temperature of 3000°, was introduced into water. The experiment is actually without danger due to the great heat. We were able to prepare 250 to 300 ingots of iron by sudden cooling and we never had an accident. With other metals, bismuth in particular, this was not always the case.

The metallic ingot was treated with boiling hydrochloric acid until no iron remained. There then remained three kinds of carbon: A small quantity of graphite when the cooling was rapid; a brown colored carbon in very thin, distorted layers apparently having been submitted to strong pressure (we found the same variety in the specimens of iron from Canon Diablo); finally, a very small quantity of a somewhat denser carbon was formed, which we endeavored to separate.

It was repeatedly treated with aqua regia, then alternately with boiling sulphuric and hydrofluoric acids. The residue was introduced into sulphuric acid and heated to 200°, while small quantities of powdered potassium nitrate were added. All of the amorphous carbon was destroyed. The heavier portion, examined with the microscope, contained only very little graphite and the different varieties of carbon. It was treated six or eight times with potassium chlorate and fuming nitric acid, which we prepared as free from water as possible. After a final treatment with boiling hydrofluoric acid, then after decantation with boiling sulphuric acid, to destroy the fluorides formed, it was washed, the residue dried and the heavier particles separated by means of bromoform.

After the first separation with bromoform, the small residue that sank to the bottom of the liquid was washed with ether and introduced into a small tube containing methylene iodide. Some small, transparent particles sank to the bottom, and black fragments swam on the surface. Both were collected and separately introduced into a conical wine-glass with a large excess of distilled water.

It was taken up with a pipette, brought on a glass slide, covered with a slip and examined with the microscope. The opaque particles had a rough appearance, a gray-black color, similar to the specimens of black diamond. Their density varied between 3 and 3.5, since some sank in methylene iodide and others in bromoform. Some had a less roughened surface and a deeper black; one showed curved edges. Others had well-terminated angles and which at first sight appeared to be cubical. . . .

In general, when the iron used in these experiments was free from silicon and when the crucible did not contain aluminum, the black or transparent particles left no ash when burned in oxygen. . . .

Experiments in Iron Filings

It appeared to us that the rapidity of the cooling had an important influence on the formation of crystalline carbon. On cooling the crucible in water, the heating completely prevented contact between the red-hot iron and the liquid. At the beginning the cooling was mainly by radiation. In order to more quickly lower the temperature we attempted to cool the liquid fusion by conduction. To this end, 200 grams of iron, saturated with carbon in the electric furnace, were poured in a cavity made in the center of a mass of iron filings and then completely covered with the filings. The fusion was surrounded by fused iron and the whole rapidly cooled, due to the conductivity of the filings. After action of the acids, the treatment with potassium chlorate and nitric acid, and the action of hydrofluoric acid, then with boiling sulphuric acid, there remained small diamonds having a rounded form and rarely showing a crystalline appearance and almost always enclosing small black points which are called spotted diamonds in jewelry.

These spotted diamonds had a density of 3.5, scratched the ruby and burned readily in oxygen, giving carbon dioxide. In this experiment the pressure appears to have been less and the conversion of carbon into diamond less complete; the yield, moreover, is always very small. The experiment of cooling in iron filings was repeated a large number of times (about forty times). When the fusion had been regularly formed and when it contained no cavities, the result was always the same. The form of the spots was variable, sometimes forming small, black spots distributed by chance, sometimes forming local regions.

We regard this formation of diamonds with spots as very important, since it gives results similar to those found in nature. Moreover, from their peculiar appearance, it was possible to recognize at once that the fragments were diamonds. In fact, it sometimes occurred that small, transparent grains were obtained whose density was greater than methylene iodide and which resisted all of the treatments with the acids and potassium chlorate, and which were not formed of carbon. These particles never showed definite angles, striations, or triangular impressions; they were rounded and did not burn in oxygen. After combustion they were found in the platinum cups, their form was not changed, frequently their surface was only slightly corroded. This substance was formed especially with irons rich in silicon, or when the electrode contained a considerable quantity of silica or alumina.

*The oxygen was prepared in the laboratory from a mixture of potassium chlorate and manganese dioxide, the latter having been first strongly heated. Before each combustion, this oxygen was tested with potassium pyrogallate. It should not contain more than 3 per cent of other gases.

Henri Moissan was born September 28, 1852, in Paris, and died in the same city February 20, 1907. Educated at the Museum of Natural History, he began teaching toxicology at the age of 34. The same year he isolated fluorine for the first time, by means of electrolysis. Turning to inorganic chemistry, he invented the electric furnace and prepared in it many new compounds. Carbides, silicides and borides were made, and the production of artificial diamonds was attempted. The minute crystals which he made passed his three tests for the diamond: hardness, specific gravity and combustion in oxygen with a definite yield of carbon dioxide. He also made other crystals of an obscure silicide with some of the properties of the diamond and an even greater hardness. The question of whether or not he really did produce diamonds has recently been reopened in England by the discovery that his method of quickly chilling the outside of a mass of cast iron does not result in great pressure in the interior as he had supposed.

Boiler Works At 3,375 Lbs.

Physics

Steam at a pressure of 225 atmospheres, or 3,375 pounds per square inch, is generated in a new battery of boilers recently installed at the Siemans-Schuchert Works at Charlottenburg. The installation has attracted considerable attention among German power engineers because of a number of unique features it involves. The design was developed by an Englishman, Benson, but the German plant is its first construction on a large industrial scale.

Each boiler consists of a high, relatively slender octagonal tower. There is an open interior space, surrounded by the water tubes. Coal dust is used as the fuel. This is blown in at the top of the tower, together with a blast of pre-heated air, and combustion takes place in the central open space, generating an unprecedently high firebox temperature, and producing steam at a pressure of over 3,000 pounds per square inch and a temperature of 450 degrees Centigrade.

At the bottom the small amount of ash falls out, and the combustion gases are turned back to warm up the pre-heater for the air blast, which is raised to a temperature of 400 degrees Centigrade before it enters the combustion chamber. So completely is the heat used up that the outside of the towers are said to be but little warmer than the surrounding air.

No firemen or boiler tenders are required, for the coal dust, air and water supplies are all regulated electrically. There is not even any boiler house; the towers stand out in the open. The elimination of a shelter for the boilers of course effects an additional saving in installation costs.

Science News-Letter, August 18, 1928

Baths Cure Seasickness

Medicine

When the ship begins to pitch and roll and you feel waves of seasickness overwhelming you, try a salt water bath. The water should be from 90 to 95 degrees Fahrenheit, its specific gravity 1.020.

Lie in the bath with your eyes blindfolded, your body supported lightly at shoulders, buttocks and back of head, with the toes just touching the end of the tub to keep the legs from floating. Stay in the bath for a half hour, an hour, or longer if necessary. This procedure gives great and usually permanent relief within a short time.

This method of treatment was worked out by Dr. R. A. Bennett, who used it in extreme cases where exhaustion from seasickness was becoming dangerous. The bath moves as the ship does, but the water has not time to respond to the motion, so it and the patient immersed in it remain fairly motionless. It is this relative immobility and not the sedative effect of the bath that is responsible for the relief it gives.

Science News-Letter, August 18, 1928

The white rhinoceros, the third largest land mammal in existence, is becoming scarce.

The United States imported $2,900,000 worth of iodine last year, all of it from Chile.

Blindfold Test Fails

Psychology

The evidence in widely published cigarette advertisements that tell how blindfolded celebrities selected the particular brand whose money bought the advertising space is called in question by exhaustive psychological tests carried out in Reed College, Portland, Oregon, by Louis Goodman, a graduate student. Instead of the hundred per cent. recognition claimed in the advertisements, the seasoned smoker-subjects were able to pick their favorite brand only once in every nine times that it was presented to them.

By pure chance, the smoker should be able to recognize his favorite brand in 17.6 per cent. of the attempts, but in the tests the rating made was only 11.6 per cent. Even when not blindfolded the testers could not tell what cigarettes they were smoking if they were not allowed to see the label.

The conclusions of the tests claim that smokers can not recognize brands on the basis of odor or taste, name brands correctly when deprived of visual clues, differentiate between two cigarettes, differentiate between strong and mild cigarettes, or tell the difference between straight Turkish and domestic tobaccos.

Science News-Letter, August 18, 1928

France reported the lowest infant death rate in its history in 1927.

Nature Ramblings

By Frank Thone

Natural History

Flying Fish

Trans-oceanic voyagers, and occasionally seaside vacationers as well, will have opportunities to see the fish that is said to have caused the familiar phrase, "Tell it to the Marines!"

The story is, that when Charles II first heard of flying fishes he was incredulous, but upon being assured of their actual existence by a captain of the Royal Marines, His Majesty declared that thereafter when he heard any incredible tale he would refer it for verification to these much-traveled sea soldiers.

The flight of a flying fish is, of course, not like the flight of a bird or a bat, but a volplane or glide, like the swoop of a flying squirrel. Only instead of diving downward like the flying squirrel, the flying fish dives upward. He drives himself rapidly through the water with his tail, which is the principal organ of propulsion in fish; then, breaking water like a trout leaping at a fly, he spreads out his wide, thin side fins and skims along through the air on them as far as the energy accumulated in the preliminary rush will carry him. It is really a kind of marine broad-jumping, assisted by sustaining planes.

Some flying fish shake and rustle their fins as they sail through the air, but whether these movements lengthen their flight is disputed by naturalists. There seems, however, to be no true wing-beat motion, such as that of birds.

There are a great many species of flying fish, some of them equipped with one pair of flying fins, some with two pairs. Many of these species are gracefully shaped and gorgeously colored. The true home of the flying fishes is in tropical waters all around the world, but some of them range northward and southward into warm temperate waters.

Science News-Letter, August 18, 1928

Mediaeval Medicine

Medicine

JOHN RATHBONE OLIVER, in *International Clinics.*

"Mediæval" and "The Middle Ages" are terms that we use in a more or less loose connotation. By them we designate a period in our civilization extending, roughly, from the final disintegration of the "Pax Romana", with the loss of all the old physical and mental achievements, down through centuries of disorder, in which the stabilizing elements wrought slowly to bring some order out of chaos, until after one or two False Dawns the new and abiding light broke in the minds of men with their rediscovery of the long-lost ancient world and their assimilation of the forgotten treasures of Greece and Rome. Modern scholarship has shown a new and remarkable interest in the Middle Ages. All this new interest must rebound to the benefit of the medical historian. Today, as never before, he has a chance to reach at first hand, accurate knowledge of many mediæval medical texts, to enter intelligently into the whole spiritual current of mediæval life, and to understand the place in it which his mediæval colleagues occupied. There are two characteristics of the Middle Ages that strike the most casual reader as he works his way through one treatise or novel or sermon after another. First, a childish simplicity, a happy credulity to which nothing is impossible if it be only presented by accepted authority, be that authority claimed by the most unlikely person to know anything about the matter in hand. And then there is a brutality —which is, however, not always coarse, but simply outspoken, and which one meets with so constantly in the satirical or parodistic literature. As the basis of all mediæval life was more or less religious, so medicine and religion were often indistinguishably mingled. In the Middle Ages people took things very literally, if only those same things were said by those whose authority and knowledge were generally accepted. The Middle Ages had not only their general "practisours" but they had their "specialists" also. In surgery, for instance, there were certain men who were famed for their specialized knowledge and technic of one single opeartion. Naturally, there were many quacks of the most preposterous kind.

Science News-Letter, August 18, 1928

An active brain is about 85 per cent. water.

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Clues to Prehistoric New Mexicans

Archæology

The mystery of the unknown people who centuries ago inhabited the Mimbres Valley of New Mexico is nearer solution as the result of rich archæological finds made by the expedition of the Minneapolis Institute of Arts and the Santa Fe Museum, headed by Dr. Albert E. Jenks. This year's exploring and excavating at the prehistoric ruins has just been completed.

The best clues to this long lost race have consisted of pottery jars beautifully decorated with animals and human figures. But from such meager evidence archæologists know that their manners and customs were different in many ways from other tribes of the southwest. Their age has been pronounced vaguely prehistoric, and no one knows where they came from or who their descendants may be.

The Minneapolis expedition has succeeded in excavating ruins of a house with four floors, one laid above the other, revealing four successive stages of culture. Dr. Jenks, professor of anthropology at the University of Minnesota, tentatively concludes that the settlement may date back to 2000 B. C. and that it probably lasted until 600 A. D. Fireplaces were found in all four levels of the house, and the doors in the different levels were on different sides.

Fifteen boxes filled with the fruits of six weeks' digging have been shipped to Minneapolis for study and exhibition. Possessions of the Mimbrenos discovered include much turquoise jewelry, many shell necklaces, strings of colored beads, a grasshopper pendant, spear heads, and many decorated pottery bowls. Three-fourths of the objects discovered will go to the Minneapolis Institute and one-fourth to the Santa Fe Museum, which was represented in the expedition by Wesley Bradfield.

The little skeleton of a prehistoric American child, still adorned with all its tiny bracelets and trinkets, is one of the outstanding discoveries of the expedition. Out of 157 burials found by the expedition, this grave contained the largest number of articles.

Apparently this child was much lamented and was laid away with great care. Following the custom of these aborigines, the child's head was covered with a beautiful pottery bowl, decorated with a sunfish. One arm still wore seven little shell bracelets, and near the knees were eight shell tinklers. A tiny copper bell, with the string still preserved after many centuries by contact with the copper, was one of the child's possessions that is attracting especial interest of the archæologists, since no object of this sort has heretofore been found with this ancient tribe. Scattered in the grave, their string long since decayed, lay 1,500 tiny red and blue-black beads and a small shell pendant. A little bone ring was another toy or ornament.

One mystery of the Mimbrenos is how a people who must have had a fairly crude manner of living could have produced such beautiful and artistic pottery designs. Another mystery is how and why this art so completely disappeared.

"The designs on the Mimbres pots far surpass the work of any other Indians of either prehistoric or modern times," the anthropologist declares.

Science News-Letter, August 18, 1928

Expedition Will Study Coral Reef

Biology

The wealth of sea life along the Great Barrier Reef will be studied by a British expedition that sailed for Australia, May 26. Naturalists of the expedition staff will investigate the composition and formation of the enormous coral reef and feeding habits of the sea animals. They also hope to study the commercial possibilities of the region, including oyster, pearl, turtle, and trochus shell resources.

For one year, possibly two, the staff will live on an island uninhabited except for lighthouse keepers, and will make motor boat trips to the Great Barrier Reef from time to time.

The expedition is headed by Dr. C. M. Yonge, naturalist, who has been on the staff of the Marine Biological Association. The project of studying the world's longest coral reef was promoted by the British Association for the Advancement of Science, and a number of scientific organizations have subscribed to the $50,000 fund to cover expenses.

Science News-Letter, August 18, 1928

Ancestral Hooch

Anthropology

A young Diegueno Indian who found the white man's bootleg hard to get has recently tried concocting the old-time whiskey of his ancestors —with results that have scared off any other young Indians who might be seized with the same inspiration.

Facts of the unusual incident were learned by Arthur Woodward, anthropologist of the Los Angeles Museum. This youth of the Volcan Reservation, near Santa Ysabel, had heard stories of how his ancestors used the Jamestown or jimpson weed in ceremonials before the white men came into the West. The Indians dried the roots and crushed them in a special ceremonial mortar and made a powerful narcotic drink, Mr. Woodward states. Young men who drank it fell into a stupor for one to four days and in their dreams they learned which animals or birds were to be their personal totems to help them through life. Weaker boys sometimes died from overdoses. Early Spanish missionaries undertook to stamp out such customs but this "toalache ceremony" survived to some extent up to half a century ago.

"The young Diegueno noticed that jimpson weed was plentiful," says Mr. Woodward. "The old folks said that it made a man drunk and happy. So, this ambitious youth gathered some roots, pounded them, and made a small keg of jimpson weed brew. He drank heavily of the stuff, and for several days was like a man possessed of devils. His companions did not learn what made him act so 'crazy' for several days."

The young Indian is "cured." So are the other Indians who saw him.

Science News-Letter, August 18, 1928

Electrocuted Tree

Botany

A freak stroke of lightning apparently electrocuted a large white oak tree in the New York Botanical Garden recently. The tree was struck during a thunderstorm, but was not shattered as trees frequently are by lightning. Almost immediately, however, the leaves began to wither, and within a month the tree presented an autumnal appearance against the bright green of the rest of the grove. Continued observation convinced the garden authorities that the tree was dead, and that it had apparently died instantaneously. After it was cut down a ring count gave its age at approximately 200 years.

Science News-Letter, August 18, 1928

The Founder of Medical Progress

Biography

An extended review, prepared by the American Association for Medical Progress, of ERNEST HAROLD BAYNES, NATURALIST AND CRUSADER—Raymond George—*Houghton, Mifflin* ($4).

On May Day sixty years ago, Ernest Harold Baynes was born in Calcutta. Only three years ago he died in Meriden, New Hampshire. In the fifty-seven years that have intervened the American nation has awakened to the real significance of animal life in its relation to humanity; and it is due in large part to Baynes' quiet unceasing and effective interest that this resulted in anything beyond a passing public emotionalism.

Baynes was a lover of wild life and was the possessor as well of a keenly observant mind, which he early trained to the analytic precision of the scientist. More than this, he had that rare faculty of organization for the accomplishment of a definite end, the lack of which so often turns reasoned scientific effort into merely abstract speculation. The result was that for each one of Baynes' major interests as a naturalist, there exists today an active organization founded by him for the purpose of keeping alive the ideals, and of accomplishing the work for which his own life was not long enough. This is a remarkable record, and the man who made it is clearly not to be classed with the sentimentalists with whom we often associate the term "nature lover".

Baynes' ambitions as a naturalist from the first took the form of efforts in behalf of a better appreciation of animals in their relation to man. Raymond Gorges' biography of Baynes tells how this interest developed into a lifelong crusade to make men understand his viewpoint. His efforts became conspicuous when he joined with John Burroughs and Theodore Roosevelt in the attack on the "nature fakers", which so agitated the country at the beginning of the century. This was the beginning of a long struggle to develop an intelligent public interest in the conservation of wild life. Many names famous in science and literature appeared in this struggle; to Baynes fell naturally the task of converting into action the interest thus created. When he found that the American buffalo was in danger of almost immediate extinction, he organized a committee of naturalists and writers, first to hammer at Congress until the necessary steps were taken to secure permanent buffalo ranges, and next, through public and private effort, to get these ranges stocked. One hundred and forty-five buffalo were known to exist when Baynes began his work; today there are over fifteen thousand. America's vanishing wild birds interested him throughout his active life and he effected numberless organizations in their behalf. Many of the local bird clubs in America today owe their inception to him, and he was largely concerned in the movement for the creation of "bird sanctuaries." During the war he studied the uses of animals in the Allied campaign and his book "Animal Heroes of the Great War" published after his death, was the result.

Throughout his career, Baynes engaged in many bitter controversies with those who slaughtered wild animals for sport or for gain, or otherwise worked injury by ignorance, fear, or unreasoning sentiment. His final struggle, to prove the value of animal experimentation in the medical sciences, was the most tempestuous of all. He had arrayed against him the whole antivivisectionist cult with its great power of wealth and social influence. Baynes attacked the problem in characteristic fashion. He got the truth at first hand, by a nation-wide tour of the leading laboratories in which animal experimentation for scientific and medical purposes is carried on. Then he entered upon an energetic campaign to get the truth before the people through lectures, pamphlets and magazine articles. At last, when he had won his fight so far as the thinking public were concerned, and had secured general recognition of the vast benefits secured to man and animals alike by the practices which his opponents had always assured a credulous public were vicious and cruel, he helped to form the Society of Friends of Medicine. After his death this society was continued as the American Association for Medical Progress, for the purpose not only of protecting the medical sciences from zoophile onslaughts in the future, but for keeping systematically before the public the truth about medical discoveries.

Cancer of the stomach caused Baynes' death while he was yet in the prime of his life. But he nevertheless had lived to see, through his own efforts, the restoration of the buffalo as a permanent species, the growth of a kindlier and more intelligent concept of animal and bird life, and finally the removal of the vivisection myth as a danger to legitimate medical research. Any one of these accomplishments would have been sufficient to crown one man's life.

Science News-Letter, August 18, 1928

Industry In Russia

Economics

STUART CHASE, in *Soviet Russia:* In Russia a factory is a landmark; it is pointed out as one points out a castle or a skyscraper in other lands. There are probably more factories in Pennsylvania than in all Russia combined. Over 80 per cent. of Russians are peasants tilling the land, and, in off seasons, doing a little industrial handicraft work. Of those who live in the towns and cities, a large fraction—altogether too large from the standpoint of efficiency—is engaged in the processes of retail distribution, tending store and peddling on the streets; another large fraction is concerned with government administration and the usual professional services; a third large fraction carries on building construction and public utility services, leaving as straight factory and industrial shop employees (in establishments having upwards of 30 workers each), not over 3,000,000 persons out of a total population of 150,000,000. In Russia, 2 persons out of 100 work in factories; in the United States about 8 persons in 100—four times as many relatively. We are a highly industrialized nation committed to mass production; Russia is farming country with a factory and a mine here and there, and mass production only in evidence as a goal of the future.

Science News-Letter, August 18, 1928

FIRST GLANCES AT NEW BOOKS

THE MIND OF THE GROWING CHILD—Edited by Vicountess Erleigh—*Oxford University Press* ($1.75). Lectures by fifteen well-known British child specialists, originally given before an audience of "educated mothers". The subjects, which were chosen by the mothers, include jealousy, children's books, psychology of infancy, and the effect of sunlight on the psychology of the child. As Sir James Crighton-Browne writes in the preface of the little volume: "The anxious parent—and every parent should feel more or less anxious in these tumultuous times—will gain from them much fresh insight in genetic psychology and many helpful suggestions. 'Evil is wrought by want of thought, as well as want of heart', and there is a good deal of unintentional cruelty to children—especially to those who deviate in any way from what is supposed to be the regulation standard—arising out of heedlessness, an inappreciation of mental values, and the erroneous but very prevalent conception that the child is the miniature of the adult man."

Psychology
Science News-Letter, August 18, 1928

MUSHROOMS AND TOADSTOOLS—H. T. Güssow and W. S. Odell—*Dominion Department of Agriculture* ($1). A full systematic account of the higher fungi of Canada (applicable to the Northern United States as well), clearly and understandably written, excellently illustrated with scores of full-page plates, and sold at an astonishingly low price. The Dominion government has "done itself proud" in producing this book.

Botany
Science News-Letter, August 18, 1928

THE SOILS OF CUBA—H. H. Bennett and R. V. Allison—*Tropical Plant Research Foundation* ($6.50). Agriculturists recognize that the sugar cane plantation system in Cuba is at a critical point in its history. Extensive cultivation has about reached its economic limit, and must be succeeded by intensive cultivation. This study prepares the way for the reformation, and incidentally provides for Cuba's other crops a scientific foundation which they have hitherto lacked.

Agronomy
Science News-Letter, August 18, 1928

FLORA OF THE PANAMA CANAL ZONE—Paul C. Standley—*Contr. from the U. S. National Herbarium, Vol. 27.* The Canal Zone, because of its easy accessibility and its provision of the amenities of civilization, is bound to be increasingly the resort of botanists with a little time at their disposal to get a taste of the tropics. These, as well as the fewer fortunates who can take their tropics more at length and leisure, will be thankful to Mr. Standley for having put into one convenient volume a complete systematic treatment of the higher plants of this region. *Botany*
Science News-Letter, August 18, 1928

SOVIET RUSSIA IN THE SECOND DECADE—A Joint Survey by the Technical Staff of the First American Trade Union Delegation, edited by Stuart Chase, Robert Dunn and Rexford Guy Tugwell—*John Day* ($4). Information about a variety of subjects—economic, sociologic and educational—in present-day Russia, compiled by a group of competent observers after a six weeks' tour of investigation. *Economics—Sociology*
Science News-Letter, August 18, 1928

THEORY OF CONTINENTAL DRIFT—W. A. J. M. van Waterschoot van der Gracht and others—*Am. Assn. of Petroleum Geologists* ($3.50). A symposium by leading geologists on one of the most fascinating phases of speculative geology.

Geology
Science News-Letter, August 18, 1928

WE FIGHT FOR OIL—Ludwell Denny—*Knopf* ($3). Mr. Denny develops a disturbingly well-supported thesis that the present major struggle in international politics, which may in the end lead to war between the United States and Britain, is for the control of the world's oil fields.

Economics—Geography
Science News-Letter, August 18, 1928

AND SO TO COLLEGE—Thyrsa W. Amos and others—*Univ. of Pittsburgh* (50c). A series of six radio talks on a timely subject.

Education
Science News-Letter, August 18, 1928

AMERICAN POLITICAL PARTIES AND POLITICAL CAMPAIGNS—E. D. Graper—*Univ. of Pittsburgh* (60c). A series of eight radio talks, published at a time when they will be of unusual interest. *History*
Science News-Letter, August 18, 1928

SAFETY AND PRODUCTION—A Report by the American Engineering Council—*Harper's* ($5). The relationship between industrial safety and production in over sixteen industries was subjected to careful study by a committee of experts. Their findings, chiefly expressed in charts, are given, together with a short digest of the report and recommendations for methods of handling the problem. The book should be a valuable aid to industrial and safety engineers and executives.

Industrial Engineering
Science News-Letter, August 18, 1928

THE STREAM OF HISTORY—Geoffrey Parsons—*Scribner's* ($5). A history of the world from the creation, whenever that was, to the present time, including all military, political, artistic and scientific developments, in 567 pages. Over half the book is devoted to prehistoric and ancient historic times, up to the fall of Rome. While much that is ordinarily considered important is slighted, the author is successful in conveying his conception of history as a single stream that is still flowing on to an unknown but inevitable sea.

History
Science News-Letter, August 18, 1928

HISTORY OF THE SHEFFIELD SCHOOL OF YALE UNIVERSITY—Russell H. Chittenden—*Yale Univ. Press* ($10). The Sheffield Scientific School at Yale has played such an important part in scientific history that a history as complete as given in these two volumes is a valuable contribution. As its director from 1898 to 1922, Dr. Chittenden is without doubt the best qualified person to write such a history, and he has made full use of his opportunity.

General Science—Education
Science News-Letter, August 18, 1928

ZOOLOGY, OLD AND NEW—R. T. Hance—*Univ. of Pittsburgh* (60c). Professor Hance has put together a series of eight radio talks into a very readable popular account of the history of zoology. He devotes a good deal of space to entertaining discussions of the weird things zoologists believed in the early days when the dividing line between hard fact and "unnatural history" was not very clearly drawn.

History of Science
Science News-Letter, August 18, 1928

"Ancient Cymric" Medicine

Medicine

SIR EWEN MACLEAN, president, British Medical Association, in *The Lancet:*

A thousand years ago King Hywel the Good caused the laws of Wales to be codified, and it is in these codes that we get the first authentic glimpses of our profession and the manner of men who practised it in tenth-century Wales. This monarch had a court physician who was given place and prestige in his presence, had a grant of free land and a horse, and received his linen clothing from the Queen and his woollen clothing from the King. His seat in the hall within the palace was at the base of a pillar near to the King, and his lodging was with the chief of the household. It was his duty to administer medicine without charge to all within the palace, and to the chief of the household. It would appear that he was a whole-time officer, with intervals when, on the basis of a moderate tariff, he was allowed to enjoy the stimulating freedom of private practice. He had to accompany the armies, but ordinarily he was never to leave the palace without the King's permission, when he was free to take any road or route with the messager of the sick. In those days it was lawful for anyone to take another's horse to procure a medical man for a person in danger, without being required to make amends. The same principle applied today in respect to motor cars might lead to serious misunderstandings.

The chief interests of these early codes, from a medical point of view, lies in the way they assessed legal damages for injuries and laid down standard fees for treatment. The thumbnail, for instance, was worth 30 pence. One front tooth was equal to a finger; one molar tooth to a thumb.

Mediæval Traditions

The old laws are interesting as showing us something of the state of the Welsh *meddyg* under the Welsh tribal system in the tenth century. The eleventh century brought with it great changes in Welsh history. A great new formative influence came then into the life of Wales—that was the Norman. The Norman affected profoundly the whole course of Welsh life and politics. Under the walls of his castles there grew up townships, markets, forts. Once more, as in the days of the early wandering Celtic missionaries Wales came into touch with the rest of Europe and the world. For not in Wales and England only, but in Ireland, in France, in Spain, in Sicily, in Palestine even, on the threshold of immemorial East—there too were the castles of the Norman. Pilgrim and Crusader, merchant, monk and friar, errant knight and troubadour, all whose activities helped to render knowledge fluid and international throughout the Holy Roman Empire, must have helped towards the building up of a native medical tradition in mediæval Wales, a tradition which has left behind as its monument a fourteenth century manuscript, the older of the two manuscripts known as the "Books of the Physicians of the Myddfai."

It was but natural that the tradition of the physicians of the Myddfai in mediæval Wales should trace its origin back to the fountain head of a legend.

In the fastnesses of the wild Fan Mountains of Carmarthenshire there is hidden away a small lake known as Llyn-y-Fan Fash. Long ago, so the legend runs, a shepherd boy named Gwyn was tending his flock on the shore of the lake when a most beautiful maiden emerged from the mirrored surface of the water. After many complications, which are so essential to a fairy tale, Gwyn and the maiden of the lake became man and wife. Three sons were born to them, but after a time the maiden disappeared again into the depths of the lake, taking with her her faery dowry of cattle and chattels. At a later day, however, she reappeared to her three sons, who kept vigil for her on the shore. The eldest son, Rhiwallon, she led aside to Pant-y-Meddygon (the Physicians' Hollow); there she revealed to him the properties of the medicinal plants and herbs which grew around them, and called upon him to dedicate himself to the art of healing. This Rhiwallon did, so that he became the physician of Rhys Grug, Lord of Llandovery and Dynevor. Tradition claims, too, that the descendants of Rhiwallon practised their art at Myddfai in unbroken lineage until the end of the eighteenth century.

Such, in brief, is the story of the physicians of Myddfai.

Interesting though these earlier figures may be, however, it is only after the Renaissance had rejuvenated Wales that we come upon the beginnings of a really brood-culture among Welsh physicians. Although not one of the outstanding physicians of Wales in Tudor and early Jacobean times had any claim to be compared to a Sydenham or a Harvey, they were yet figures commanding interest and respect in other ways. Educated, most of them that we know of, at the older English universities, their medical writings and their medical beliefs were, for their day and generation, reasonable and scientific. One striking characteristic which many of them had in common was the great breadth of their culture and their scholarly achievements in other arts besides medicine. Thus Phaer of Pilgeiran was one of the first great Elizabethan translators of the classics, while to Robert Recorde of Tenby we owe the introduction of the study of algebra into this country.

Time does not permit to follow the fortunes of the Welsh *meddyg* through the seventeenth and eighteenth centuries. Something of their ubiquity and prominence may be gathered from the fact that the two surgeons on board Captain Cook's ship the *Resolution* in 1777 were Welshmen—Robert Davies of Wyddgrug, and David Samuel of Denbigh. Samuel later became surgeon of the *Discovery*, and he may have suggested to his captain some of the latter's very enlightened ideas regarding the relationship of scurvy to diet. At any rate, Samuel was a scientifically minded man, as shown by his treatise on the introduction of certain diseases among the South Sea Islanders. "He was," so wrote one of his contemporaries, "extremely irritable, but one of those hearty fellows we expect a sailor to have been."

But however true it may be that the past, even the distant past, is ever with us and must tincture our very thought and deed, the blend of the present and the immediate future is the main incentive to individual and corporate action.